

5      WHAT IS CLAIMED IS:

1.      A combustor having a catalyst module comprising at least one duct with a first and second flow path, the first flow path on the inside of the duct along an inside wall thereof and the second flow path on the outside of the duct along at least one outside wall thereof, both the inside wall and outside  
10 wall of the duct being lined with a barrier layer and one or the other of the inside wall or outside wall has a catalyst coating over at least part of the barrier layer.
2.      The combustor of Claim 1 wherein the barrier layer is a NiAl zone.
3.      The combustor of Claim 2 wherein the barrier containing the catalyst is  
15 less dense than the barrier on the other side of the duct wall.
4.      The combustor of Claim 3 wherein the barrier layer on the other side of the duct wall is approximately between 10% to 50% denser than the barrier layer containing the catalyst.
5.      The combustor of Claim 4 wherein the barrier layer on the other side of  
20 the duct wall is up to approximately between 10% to 50% denser and, preferably, 25% denser than the barrier layer containing the catalyst.
6.      The combustor of Claim 2 wherein the barrier layer that interfaces with the catalyst is porous throughout the layer.
7.      The combustor of Claim 1 wherein the barrier layer is both chemically  
25 and mechanically bonded to a substrate.
8.      The combustor of Claim 6 wherein the barrier layer containing the catalyst also can have an alumina, zirconia, titania, and/or ceria, and an inorganic bond phase coating on an outside surface that supports the catalyst.
- 30 9.      The combustor of Claim 7 wherein the barrier layer contains an alumina and an inorganic bond phase coating on the inside surface of the tube that becomes part of the substrate.
10.     The combustor of Claim 1 wherein the duct is a tube.
11.     A catalytic combustor duct having an inside surface and an outside  
35 surface with both of the inside surface and outside surface being lined with a barrier layer and one or the other of said inside surface or outside surface

- 5 having a catalyst coating over or through at least part of the barrier layer.
12. The combustor duct of Claim 11 wherein the barrier layer is a NiAl zone.
13. The combustor duct of Claim 12 wherein the barrier containing the catalyst is less dense than the barrier on the other surface of the duct.
- 10 14. The combustor duct of Claim 12 wherein the barrier layer that interfaces with the catalyst is porous.
15. The combustor duct of Claim 11 wherein the diffusion barrier layer is both chemically and mechanically bonded to a substrate.
16. The combustor duct of Claim 14 wherein the diffusion barrier layer underlying the catalyst has an alumina, zirconia, titania, and/or ceria, and an inorganic bond phase coating on an outside surface that interfaces with the catalyst.
- 15 17. The combustor tube of Claim 11 wherein the duct is a tube.